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Quantum Mechanics still seems to be ***NOT***-understood by mankind!

And when noticing that even Albert Einstein had many problems understanding General Relativity himself as it should be solved with “linear” mathematical tools, the fact that no-body understands the Standard Model of “simple” Special Relativistic Quantum Field Theories doesn't seem very strange!

Albert Einstein solved curvature of 4D-spacetime using techniques developed by Bernhard Riemann. Bernhard used additional assumed all orthogonal linear coordinates to describe curvature of the 4D-spacetime with easy imaginable linear mathematical tools. The index specifying these more-dimensional Riemann coordinates to describe curvature mathematically was described with the n-index, with $n \geq 2 \times 4 = 8$. And because Einstein could not interpret this higher dimensional Riemann-space he always contracted all intermediate results to end up with expressions in easy-imaginable 4D-spacetime.

But was this beautiful technique with Riemann-indices actually correct, or did this technique use incorrect higher-dimensional spacetime!?!

This question was solved in 2004 by Grigori Perelman in his resolution of the Poincaré conjecture. In this mathematical analysis Grigori also showed that mathematical knots can only be described in 3D-space, i.e. 4D-spacetime!

Why is only a mathematical analysis that allows knots allowed?

In all QM theories elementary particles are assumed to be point-particles with a QM wave-function centered at this point-position of the described particle. In this analysis, the actual position of the quantum-particle is assumed to be given with this point. And this not-understood assumption is exactly why nobody is able to understand QM on easy logical imaginable grounds.

According to the CAP any possible description of physics múst also include the gravitational action. In the Standard Model of elementary particle physics compliance to the CAP is omitted! And this is the reason why nobody is able to understand QM.

The gravitational field is a symmetrical-field with 10 degrees of freedom. The EM-field is an anti-symmetrical field with only 6 degrees of freedom. Consequently these two fields are orthogonal and the gravitational-field representable by the spin2 graviton, is invisible to the spin1 photon of the EM-field.

A QM wave-function has a symmetry under rotation of the function around the axis-of-motion:

$$\Delta \varphi = \frac{2\pi}{s} \tag{1}$$

After a rotation of $\Delta \varphi$ radians around the direction of movement the particle's wave-function is identical. This is why the wave-function of an elementary spin½ particle must be rotated 4π radians to obtain the same wave-function again. This is a well-known characteristic of leptons to particle-physicists. This symmetry explains why only half of the possible characteristics of such spin½ particles are possible. (neutrino's only have left-handed chirality, while anti-neutrino's only have right-handed chirality).

In the case of the “invisible” spin2 graviton, symmetry (1) results into a doubled characteristic in the mathematical analyzed massless graviton. When rotating the wave-function of a graviton a complete circle of 2π radians around the direction of motion, the wave-function repeats itself twice. This is also the reason why gravitation curves spacetime. I.e. the coordinate-axes in this case will be curved lines in a 2D-plane instead of being simple 1D-straight-lines.

This “dual” characteristic of spin2 gravitation should be included in any acceptable mathematical analyses of physics to comply to the CAP, i.e. to include curvature inducing gravitation.

Experimentally only the spin1 photon, representing the EM-field, and the invisible spin2 graviton of the gravitational-field are massless elementary particles.
The symmetrical 4D-spacetime tensor of the gravitational field with 10 degrees-of-freedom is called the Ricci-tensor $R_{\mu\nu}$ and is used to describe the equations of motion of General Relativity:

$$R_{\mu\nu} - \tfrac{1}{2} g_{\mu\nu} R = \frac{8 \pi G}{c^4} T_{\mu\nu} \qquad (2)$$

(For more information click on the link!)

When analyzing curvature mathematically Einstein used higher-dimensional Riemann-space which resulted into the curvature tensor $R_{\mu\nu\rho\sigma}$. According to the Bianchi-identities only 20 components of this 4-tensor are independent, i.e. twice the amount of independent components of the Ricci-tensor. So in all equations for the gravitational field the dual spin2 characteristic resulting in curvature of 4D-spacetime is present.

Karl Schwarzschild only analyzed curvature in the direction of motion of planets orbiting around the sun. This was a 2D-spacetime analysis (iz, cτ), with z the direction of motion of the planet and τ the time measured from the center of this planet. He neglected sizes of the planets and rotations of the planets and the sun, yielding an easy to solve 2D-spacetime problem. Later this analysis was improved by including non-zero sizes of the planets, i.e. by "macroscopic" including curvature in all imaginable 4D-spacetime directions. Using this analysis only one of the two independent effects of curvature is taken into account.

The second effect of curvature must be a "microscopic" QM effect: Describe all elementary particles as harmonic oscillating mathematical-points in the 2D-plane orthogonal to the direction of motion of the described particle. The equations of motion can now be solved SR, because curvature can always be neglected as an higher order effect. The circular oscillating motion results in two first-order time-derivative Differential Equations from the inertial frame with origin moving with the particle in the positive z-direction. From this frame the oscillating point remains at the z = 0 position and using polar-coordinates only (ρ(τ), φ(τ)) has to be solved.

From the chosen inertial-frame the particle's extensiveness is given by:

$$2\langle\rho\rangle = \rho_{max} + \rho_{min} = 1\tfrac{1}{2}\rho_{max} = 3\rho_{min} = s \cdot \varphi \cdot l_h \qquad (3)$$

With s the half-integer spin in the direction of motion (z-axis), φ the Golden Ratio and l_h the Planck-length.

The DE explicitly describe both the spin and the energy proportional to the frequency $E = h \cdot f = \hbar \cdot \omega$ of the representing field of the elementary particle using easy-imaginable mathematical tools. The exact mathematical solutions explain completely why the beautiful Golden Ratio appears so often in our daily life!

Elementary Particles just aren't point-particles, but ***múst*** be described as extensive harmonic oscillating particles in the 2D-plane orthogonal to the direction of motion!
The DE's describe two first-order (proper-)time-derivatives and also require Boundary Conditions as a result of circular symmetry. These BC are also "dual", i.e. they are either open-BC or closed-BC.

Closed-BC only allow one type of particle for every degree-of-freedom of the analyzed symmetry-group! As a direct result of this "simple" mathematical analysis all so-called force-particles named bosons múst be described with closed-BC. The spin2 ***dual*** orthogonal mathematical group just represents all so-called "matter-particles", i.e. fermions with half-integer spins. Open-BC imply interactions in all 3D-spacelike directions, so fermions múst always possess non-zero masses to enforce interaction with the spin2 "dual" graviton!

Open-BC can figuratively be imagined as open sheets in the 2D-plane orthogonal to the direction of motion. This characteristic allows more so-called "families" with ónly different rest-masses. Our universe experimentally shows to posses just 3 different families of fermions. And this characteristic is a fundamental characteristic of our everyday experienced reality, i.e. "***universe***"! Likewise bosons can be imagined with closed oscillating tubes in the 2D-plane orthogonal to the direction of motion. These mathematical solutions ónly allow one species of elementary particle for every degree of freedom of the analyzed symmetry group.

This mathematical analyzed characteristic of elementary particles at-once explains why Super-Symmetry múst be invalid!

When imagining the Feynman-graphs with extended harmonic-oscillating waves in the 2D-plane orthogonal to the direction of motion the transition-process boson ↔fermion (i.e. closed-BC ↔open-BC) at-once appears completely transparent.

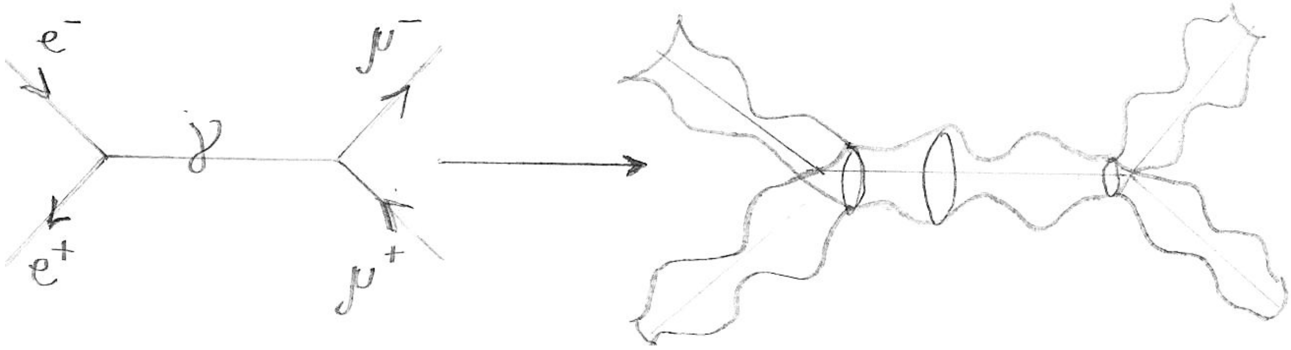

Figure 1. The Feynman-diagram of a collision between an electron and a positron should be depicted with interacting harmonic oscillating waves. Fermions have open-BC, so can be imagined as oscillating 'sheets of paper'. The borders of two fermions are able to melt together to yield an harmonic oscillating wave in the 2D-plane orthogonal to the direction of motion with closed-BC.

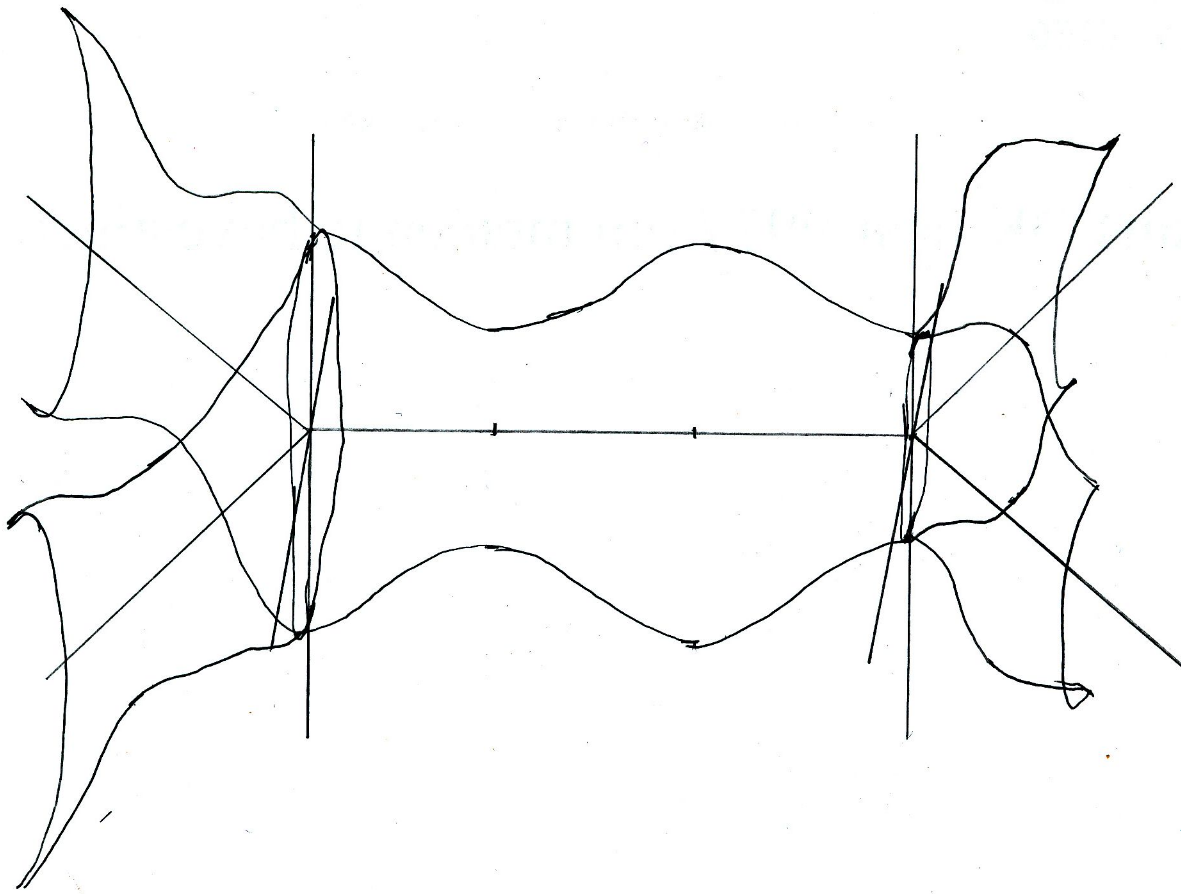

Figure 2. The two fermions analyzed as harmonic oscillating waves in the 2D-plane orthogonal to the direction of motion with open-BC melt together into one boson with closed-BC which travels as an harmonic oscillating tube until the melted boundary brakes loose again resulting in the final two fermions with again open-BC.

Elementary particles múst be described as extended harmonic oscillating waves in compliance to the CAP. The minimum distance from the average worldline follows directly from (3):

$$\rho_{min} = \tfrac{1}{3}\, \underline{s} \cdot \underline{\varphi} \cdot \underline{l_h} > 0 \tag{3}$$

So, only never observed spinless elementary particles are able to reach one another at zero distance. However, spinless elementary particles cannot posses energy proportional to a frequency, i.e. must be static. And this characteristic conflicts with the CAP. This is why "spinless elementary particles" are only ***NOT***-understood human-fiction.

Let's analyze an elementary particle: When describing the angular-momentum in the direction of motion, i.e. the spin, explicitly from the inertial-frame moving with origin at the average position of the particle in the positive z-axis one obtains two consecutive first order eigen-time derivative DE. The solutions can be written down exactly for the square-root $x \equiv \rho^2$. And because $\rho > 0$ this also results in exact solutions of ρ.

The solution-space to describe (ρ(τ), φ(τ)) has all the characteristics of the complex Hilbert-space of QM.

In QM, i.e. the "microscopic" world, macroscopic curvature can always be neglected as an higher order-effect and the complete mathematical analysis of elementary particles can be analyzed with "easy" linear-mathematical tools of SR. This is why the mathematical analysis of QM still remains correct, even though not-understood!.

First of all I shall give a complete non-reducible symmetries analysis of easy-imaginable 4D-spacetime:

Please read: Theory Of Everything and Theory Of Everything2 first. From this analysis it is now obvious that all "matter-particles" i.e. fermions, are to be described with open-BC and as a result of that all have rest-masses > 0. As a result the harmonic oscillating fermions can be analyzed moving forward, backward and forward again, such that the harmonic oscillating path allows knots.

This mathematical fact demands a mathematical analysis of fermions only in 4D-spacetime!

Fermions are the primary sources of force-particles, so without fermions also no bosons, i.e. no "***universe***" at all!

So the CAP demanded curvature of the only possible 4D-spacetime should be described in this 4D-spacetime itself. And when inserting the dual spin2 effects of curvature into the "simple" 4D-spacetime analysis all characteristics of all possible elementary particles come to life straight away. In this way both QM and General Relativity are combined in one complete Theory Of Everything with only 26 different elementary particles in our 3 fermion-families universe.

To me, it's sad that Albert Einstein himself did not discover a general logical overview of General Relativity combined with "easy" Special Relativistic Quantum Mechanics resulting into the Standard Model of particle physics without the still assumed detected elementary spinless Higgs-boson.

In any case, all still assumed mysterious characteristics of QM can be explained completely with exact solvable mathematical tools. One only has to re-scribe the Quantum-Theories in compliance with Einstein's CAP, i.e. include "dual" curvature of the only possible 4D-spacetime in the analysis.

For reactions and/or questions, please contact me below,

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